REMARKS

Applicants wish to thank the Examiner for considering the present application. In the Office Action dated September 18, 2002, claims 1-20 are pending in the application. A one-month extension of time is included herewith. Claims 1, 15, and 16 have been amended. Applicant respectfully requests the Examiner for reconsideration of the amended claims and their corresponding dependent claims.

Claims 1 and 16 stand rejected under 35 U.S.C. §102(b) as being anticipated by *Horie* (5, 558,060). The remaining claims stand rejected as being unpatentable under 35 U.S.C. §103(a) as being unpatentable over *Horie* in view of *Vattaneo* (5,839,400). Claims 1, 15, and 16 have been amended in a similar manner to reflect that the valves of the cylinder are operated so that under the three different operating conditions defined, three different types of turbulent flows are generated. That is, under a first operating condition a high swirl no-tumble turbulence is formed, under a second operating condition a swirl and tumble turbulence is formed, and under a third operating condition a tumble no-swirl turbulence is formed.

The *Horie* reference is directed to an intake valve system in which one of the intake valves is operated in accordance with the operating condition of the engine and opening and closing the other intake valve in a small lift amount, thereby producing a deflection of the intake air drawn into the combustion chamber. The abstract of the *Horie* reference states that, "The timing of the opening and closing of intake valve that is opened and closed only in the small lift amount is set at a time point such that the lift amount is maximized in the first half of the intake stroke of the piston. This is further described in Col. 8, the paragraph beginning on line 5, and Col. 8, the paragraph beginning on line 35. Both of these sections point to the controlling of the swirl within the combustion chamber. No teaching or suggestion is provided in the *Horie* reference for controlling the tumble within the operating chamber.

The *Vattaneo* reference is directed to variably actuated valves. As recited in Col. 6, line 53: "In particular, the intake conduit which is controlled by the intake valve which is always activated, is shaped so as to generate a high tumble of the air flow coming out thereof within the combustion chamber." This passage suggests that the tumble action of the valves is always actuated. However, no teaching or suggestion is found in the *Vattaneo* reference for providing no tumble with a swirl condition. The present claims have been limited to three operating conditions that include both swirl and tumble as well as no tumble and high swirl along with tumble and no swirl. The *Vattaneo* reference does not teach the three different types of turbulence recited in the claims. That is, it is not possible for the *Vattaneo* reference to provide high swirl no-tumble turbulence since the intake valve that controls turbulence is "always activated." Applicants therefore respectfully request the Examiner for reconsideration of claims 1, 15, and 16 and their associated dependent claims.

In light of the above amendments and remarks, applicants submit that all objections and rejections are now overcome. Applicants have added no new material to the application by these amendments. The application is now in condition for allowance and expeditious notice thereof is earnestly solicited. Should the Examiner have any questions or comments which would place the application in better condition for allowance, he is respectfully requested to call the undersigned attorney.

Please charge any fees required in the filing of this amendment to Ford Global Technologies, Inc. Deposit Account 06-1510.

Respectfully submitted,
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VERSION WITH MARKINGS TO SHOW CHANGES MADE IN THE CLAIMS

In The Claims:

1. (Amended) A method for generating turbulence of an air-fuel mixture in a combustion chamber of a multi-valve engine, said engine having at least first and second intake valve members each independently activated by an actuator member, with the activation of the actuator member being controlled by an engine controller unit, the method comprising the steps of:

determining [an] a first operating condition, a second operating condition, and a third operating condition of the engine;

separately operating the intake valve members to generate an air-fuel turbulence in the engine combustion chamber corresponding at least in part to the first, second and third operating [condition] conditions, so that under a first operating condition a high swirl, no tumble turbulence is formed, under a second operating condition a swirl and tumble turbulence is formed, and under a third operating condition a tumble, no swirl turbulence is formed;

wherein the optimum air-fuel turbulence is created for the operating condition to maximize fuel efficiency and minimize undesirable emissions.

15. (Amended) A process for optimizing the air-flow motion in the cylinder combustion chambers of a multi-valve engine, each of said cylinders having a first intake valve and a second intake valve, both of said first and second intake valves being individually and independently operated, and the engine having an electronic controller for operating said first and second intake valves, said process comprising the steps of:

establishing a plurality of operating conditions for the engine based on engine load and speed;

preparing a look-up table based on said plurality of operating conditions;

operating said first and second intake valves depending on the look-up table relative to a first engine load and speed; and

generating an air flow motion in the cylinder combustion chamber corresponding to one of said plurality of operating conditions, so that under a first operating condition of said plurality of operating conditions a high swirl, no tumble turbulence is formed, under a second operating condition of said plurality of operating conditions a swirl and tumble turbulence is formed and, and under a third operating condition of said plurality of operating conditions a tumble, no swirl turbulence is formed.

16. (Amended) A system for generating turbulence of an air-fuel mixture in a combustion chamber of a multi-valve engine, said engine having at least first and second intake valve members, and a controller unit, said system comprising:

means for determining [an] a first operating condition, a second operating condition, and a third operating condition of the engine;

means for separately operating said first and second intake valve members in order to generate a desired air-fuel turbulence in the engine combustion chamber corresponding at least in part to said first, second and third operating [condition] conditions, so that under a first operating condition a high swirl, no tumble turbulence is formed, under a second operating condition a swirl and tumble turbulence is formed, and under a third operating condition a tumble, no swirl turbulence is formed;

wherein an optimum air fuel turbulence is created for said operating condition to maximize fuel efficiency and minimize undesirable emissions.